

3.6 Protists

(not real kingdom – more of a loose grouping of organisms)



Image from <http://www.ucmp.berkeley.edu/allife/eukaryotasy.html>

General Characteristics:

- Most are **unicellular**
- Many are aquatic, but some are terrestrial
- Reproduce **sexually** or **asexually**
- May be **heterotrophic** , **autotrophic** or both
- There is currently no agreement of the main protist clades, it continues to change as data is collected.
- Protists are thought to be the first **Eukaryotes** and evolved from prokaryotes

The First Eukaryotes

Recall cellular features of Prokaryotes vs Eukaryotes:

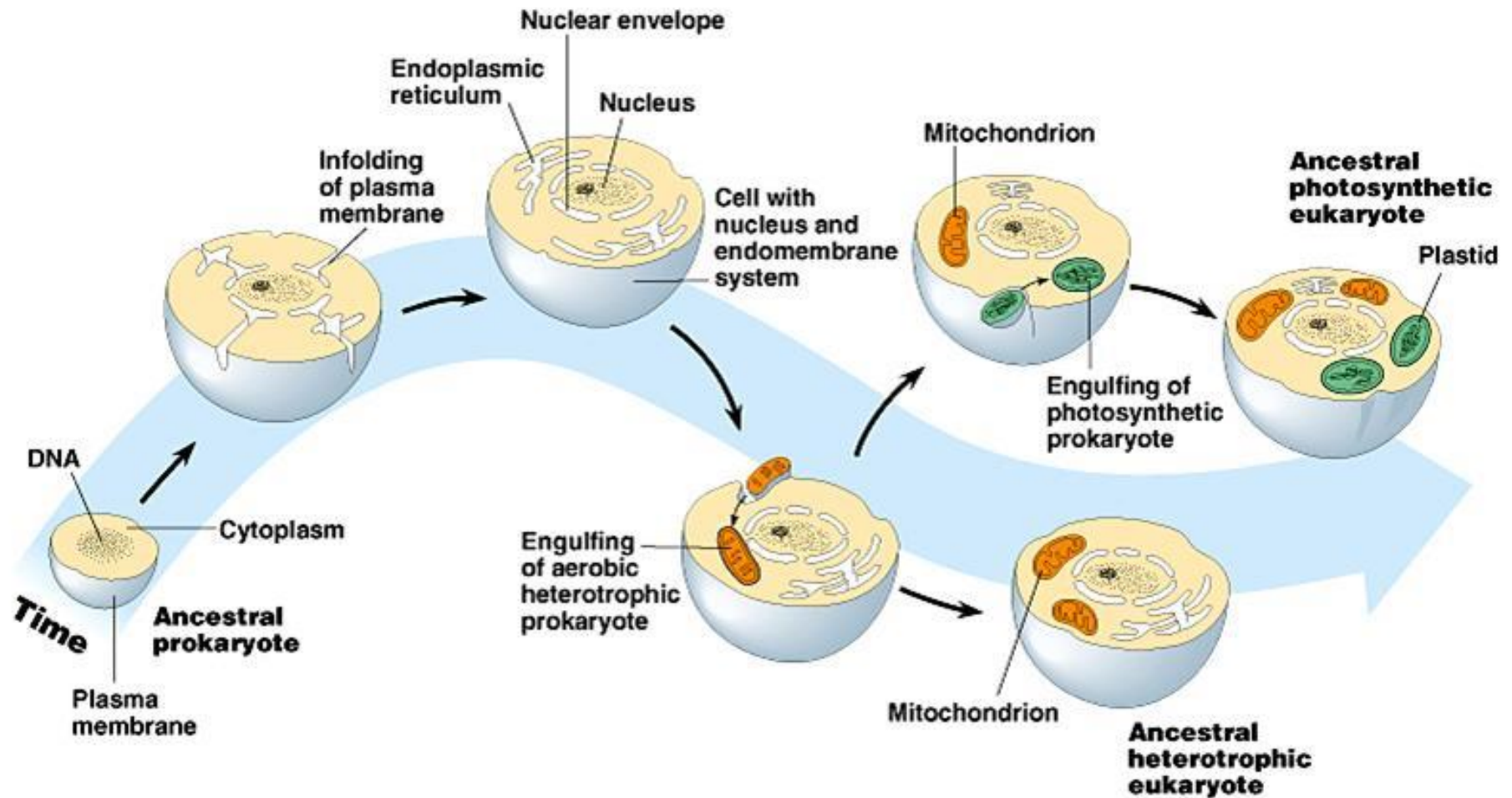
Prokaryote

- Lacks membrane bound organelles (nucleus, chl., mito., ER, etc)
- Very small
- Contains circular chromosome
- Has ribosomes
- Reproduces using binary fission

Eukaryote

- Usually large
- Linear chromosome located in nucleus or nuclei of the cell
- Contains membrane bound organelles

- Some prokaryotes can produce energy from simple organic molecules in the presence of oxygen (they are aerobic heterotrophs), while others can produce energy using sunlight (photosynthetic).
- It is likely that the ancestors of prokaryotes such as these gave rise to the organelles found in eukaryotic cells, specifically the **mitochondria** and **chloroplasts**.
- The first eukaryotic cell evolved when a larger host cell engulfed a prokaryote – probably a member of proteobacteria. Instead of digesting this organism, it developed a symbiotic relationship which over time evolved to become mitochondria. The benefit to the host was extra source of energy, and the proteobacterium gained a reliable food supply. Mitochondria have a circular chromosome, ribosomes, and can divide by binary fission, however, they can no longer survive outside the cell.



- A similar event occurred with the evolution of chloroplasts
- This is described as **endosymbiosis** and continues today with many prokaryotes forming both parasitic and symbiotic relationships with host cells.
- View the [animation](#) and record the 4 points that support the endosymbiotic hypothesis:
 1. 2 membranes
 2. Circular DNA
 3. Similar size to prokaryotes
 4. Similar characteristics to particular current-day bacteria

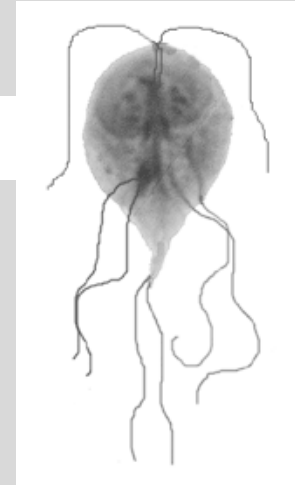
Refer to the handout to begin a very brief tour of some representative Protist groups.

Major Groups of Protists

1. Flagellates

Giardia (Beaver fever)

- Cause intestinal problems



Trypanosoma (Sleeping Sickness)

- Spread by the tsetse fly
- Attacks the brain, leads to drowsiness and eventually death



2. Alveolates



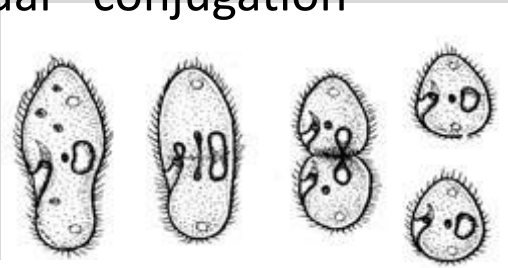
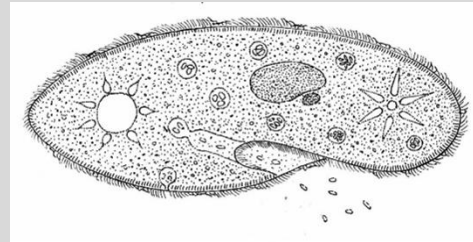
Apicomplexa

- Includes disease-causing organisms such as Plasmodium (malaria)
- Refer to plasmodium life cycle on next slide. *Define:* **Haploid** - a cell with half the number of chromosomes; **Diploid** - a cell with two copies of each

Ciliates

some

- Includes paramecium
- Asexual - binary fission
- Sexual - conjugation

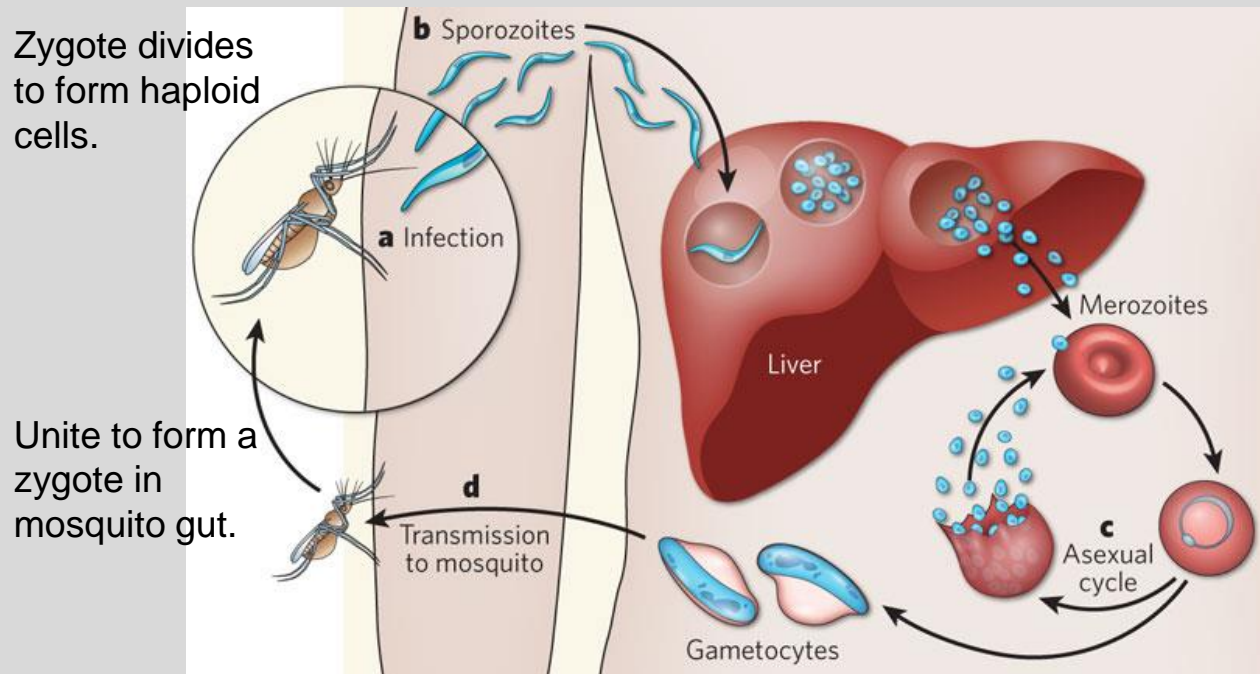


Dinoflagellates

- Cause 'blooms' (red tide) that release toxins, impacts seafood.



Plasmodium life cycle (causes malaria)

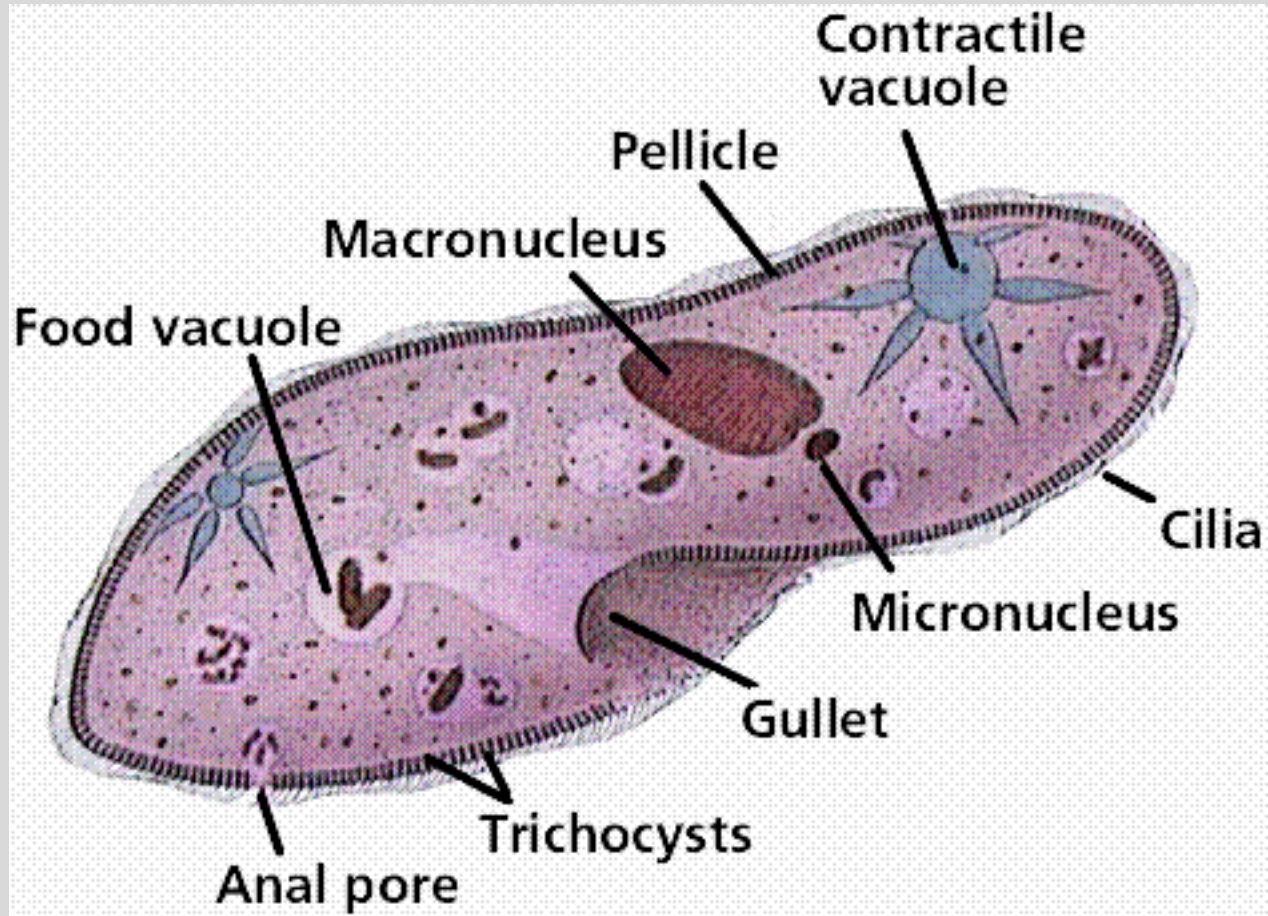


Malaria is transmitted among humans by female mosquitoes of the genus *Anopheles*. Female mosquitoes take blood meals to carry out egg production, and such blood meals are the link between the human and the mosquito hosts in the parasite life cycle

Interestingly - mosquitoes succumb to the parasite that causes malaria just like people do. But many are able to fight off the infection. Now researchers have figured out how the insect's immune system conquers the parasite—knowledge that could be used to combat the spread of malaria in humans.

<http://news.sciencemag.org/health/2010/09/how-mosquitoes-fight-malaria>

Label Paramecium

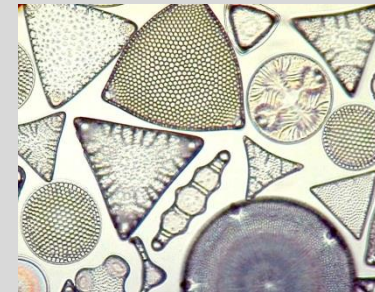


3. Chromista

- Uses chlorophyll C and other pigments
- Do not store starch

Diatoms

- Important food source for aquatic organisms
- Mined as diatomaceous earth
- Used to determine past ecological conditions



Water molds

- Caused potato famine

Brown algae

- Large, multicelled colonial organisms
- Reproduce by **alternation of generation**

Define:

Gametophyte

- A haploid organism, produces haploid sex cells

Sporophyte

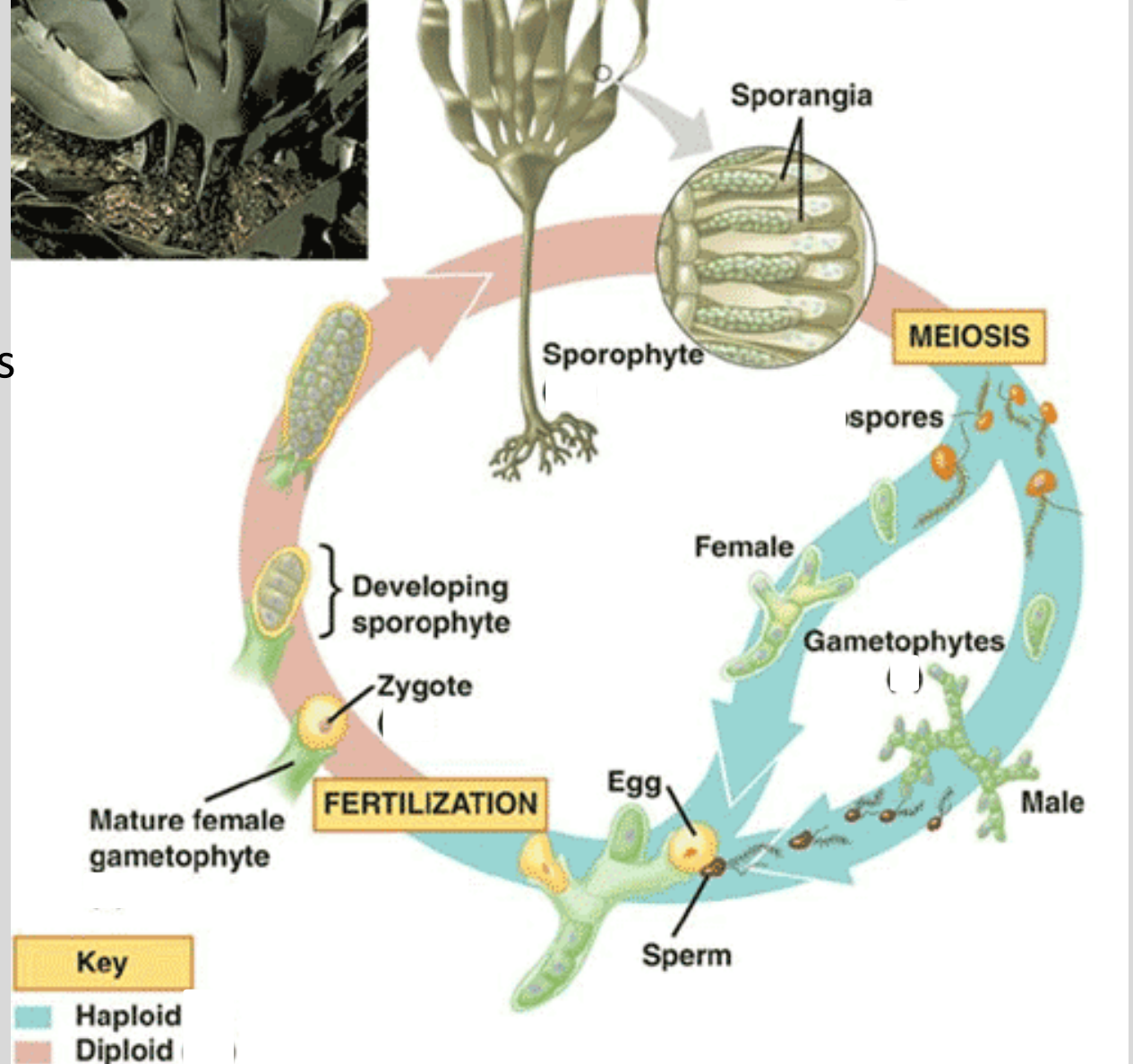
- A diploid organism, produces haploid spores

Spore

- Haploid cell that can divide to form an individual



The life cycle of Laminaria, a brown alga that shows alternation of generations.



4. Green Algae

- Share a recent common ancestor with plants



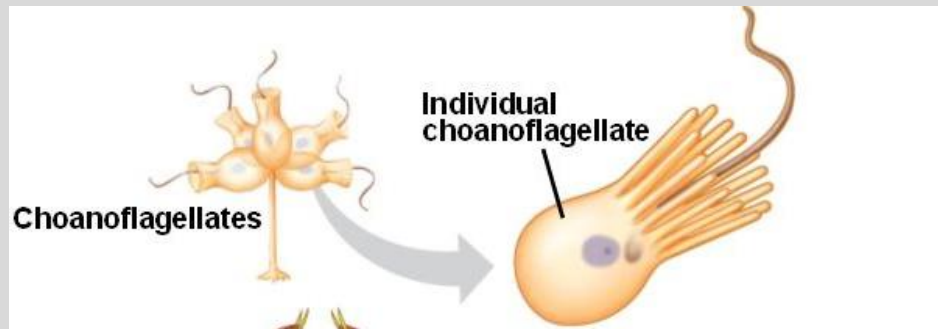
5. Rhodophyta

- 'Red algae'
- Special pigments absorb blue light, therefore can live at greater depths



6. Choanoflagellata

- Closest living protist relative of sponges (animal)



Summary of Protists

Type of Protist	Group	Societal Impact or Characteristic
Flagellates	Giardia Trypanosoma	Intestinal illness Sleeping sickness
Alveolates	Apicomplexa Ciliates Dinoflagellates	Malaria caused by Plasmodium Paramecium Blooms (red tide)
Chromista	Diatoms Water Molds Brown Algae	Diatomaceous Earth Potato famine Example of Alternation of Generation
Green Algae		Common ancestor with plants
Rhodophyta		Red Algae
Choanoflagellata		Closest protist relative to sponges